circumstances none of the differences between the adults could have anything to do with the differences of environments, and all must be due to some differences in inherent factors. In fact, the environmental correlation co-efficient would be nil, whilst the hereditary correlation co-efficient might be high. But the environment in this imaginary community might be wretched and easily improvable, whilst circumstances might make eugenic reform temporarily impossible. Would not he be a very foolish statesman who, in any circumstances at all like these, would be deterred from devoting his first efforts to environmental reform by being told that the environmental co-efficient was very small? Or, again, is it not at least conceivable as regards some zymotic disease, that the differences of environment to which individuals are exposed in no way affect the liability to catch the disease in question, all being equally exposed to infection; whilst, at the same time, might it not be possible that by some general change of environment the microbe could be exterminated and the disease stamped out? Here, again, everything needed could be accomplished by an environmental reform, in spite of the environmental co-efficient of correlation being nil. Do not such possibilities, fanciful though they be, make one wish for more light on the subject?

My suggestion is that at present we should, as far as possible, avoid such phrases as the relative influence of heredity and environment, whilst always holding in view the relative possibilities of doing good by attending to heredity and to environment. To state the problems to be solved in this form would not, I believe, make the statistical method in the least less essential; and the result would be all the more useful, from thus more clearly keeping in view the goal of our efforts. Moreover, the importance of the heredity factor would in the end thus be made to stand out more clearly because more intelligibly. On the other hand, if, as is quite possible, I am wrong, and the statistician is able to produce a completely destructive reply to these criticisms, then they will have fully answered their purpose in bringing forth that reply.

LEONARD DARWIN.

INHERITANCE OF FECUNDITY.

Having read the essay contributed by Dr. Pearl to the Eugenics Congress, I find there are several basic points upon which his conclusions require further verification, from either the biological or the Eugenic standpoint.

In the first place Dr. Pearl asserts he has ascertained that there are "two definite and clear cut results," one being "that the record of egg production, or fecundity of a hen, is not of itself a criterion of any value whatsoever from which to predict the probable egg production of her female progeny."

The second being, "that notwithstanding the fact just mentioned, fecundity is, in some manner or other, inherited in the domestic fowl."

As one who believes more firmly in the inheritance of acquired characteristics through the persistent breeding for any desired object, rather than in the Mendelian form, I desire to call attention to the fact

that such a characteristic as defined by Dr. Pearl as his first result is not known to exist in any of our other domestic animals. The fastest of our thorough-bred mares do not produce our fastest racehorses, nor can the best milch cow be relied upon to produce her equal in the capacity for yielding milk; from this standpoint I cannot realise that any such result could possibly be expected from an experiment with poultry, but no practical poultryman, desirous of producing birds of the highest laying capacity, would entertain the idea of mating any bird for breeding purposes that had not proved itself well above the average during its first season's laying, and this procedure has amply been proved by the fact that the record breakers in all the Australian Egg-laying Competitions can mainly be traced through their ancestry to one strain of birds, which had been specially built up by breeding from trap-nest tested birds for about fifteen years.

Looking at the matter from this standpoint I am of opinion there is only room for the one contention, that egg production is inherited whether its degree be high or low.

I have carefully abstained from using the word "fecundity" in connection with egg production, mainly for the reason that in the Eugenic sense, I define the word as "producing progeny."

In this respect the number of hatchable eggs laid by a high producer will, perhaps, compare with the egg cells in the ovary and the number of eggs laid, for it must not be inferred that every egg laid represents a chicken in embryo, in practical working high production and good fertility are unattainable.

In dealing with the subject of winter laying, Dr. Pearl omits to state whether he refers to hens or pullets, this makes all the difference in the Eugenic value of his experiments, for it is during this period that the hen undergoes the process of moulting, and except in rare cases, laying is suspended; whilst in regard to pullets, winter laying depends to a very large extent upon the date of hatching, which can be so timed, in accordance with climatic conditions, that the birds can be almost relied on to start laying in any given month of the year. But in any event, the chickens to be produced from a moulting hen, or an immature pullet, are small in number and undesirable in quality, therefore, as a question of fecundity in its Eugenic sense, winter eggs can safely be omitted from all calculations.

Another aspect of the case which Dr. Pearl omits is the important part feeding plays, not only in fertility, but in egg production. To ensure fertility in eggs, the hens must be kept rather poor in condition, to induce that activity which seems indispensable to good fertility throughout Nature, and leads to the theory that the Eugenist may look for an explanation of the absence of fecundity in any section of the human race by observing the dietary and exercise taken by that portion of the population, and consider the Mendelian factors afterwards.

As regards high egg production, this is also mainly a matter of feeding in any climate. If it is desired that the birds shall do their best, the nutrition must be supplied in the most scientific manner to supply the necessary ingredients to the egg-machine, and it is a debatable question if the man behind the pail is not a more important factor than the pedigree of the bird. I have known too many instances

of first-class layers being ruined by injudicious feeding, and *vice versa*, to be optimistic on the subject of egg production as a criterion in determining fecundity, whilst I have known my whole stock to be thrown off laying, by feeding slightly musty wheat, for three days.

There is another very important matter which has a direct bearing upon the eugenic aspect of fecundity to which Dr. Pearl makes no reference; that a hen will lay quite as many, if not more eggs, when not mated with a male bird, which in itself precludes any comparison with the vertebrates, where the presence of the male element is essential.

I am only giving the headings of the various subjects, which are so easy to verify that it is waste of space to enlarge upon them. There are many valuable biological lessons to be learned from the hen, but I do not think fecundity is amongst the number.

TERENCE CONNOR.

West Australia,
20th November, 1912.